



FLG 0109
Análise Espacial e
Geoprocessamento

SENSORIAMENTO REMOTO E
PROCESSAMENTO DIGITAL DE IMAGENS

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O que é Sensoriamento Remoto?

Arte e ciência da obtenção de informação sobre um objeto *sem contato físico direto* com o objeto. É a tecnologia científica que pode ser usada para medir e monitorar importantes características biofísicas e atividades humanas (JENSEN, 2000).

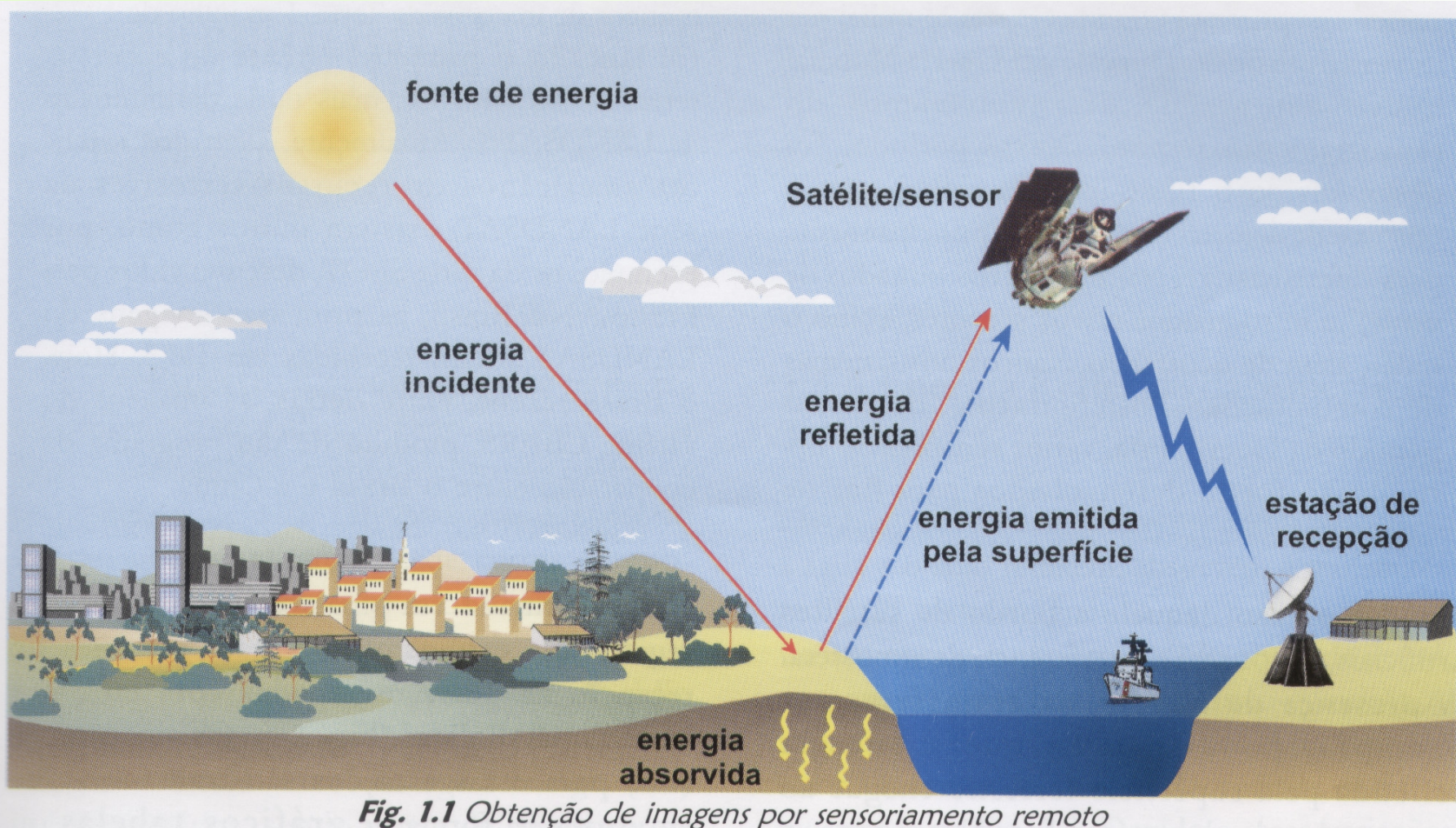
Principais Divisões

Sensoriamento Remoto Orbital (Satélites)

Sensoriamento Remoto Aéreo (Aviões)

Levantamentos em campo

Aquisição de dados



Aquisição de dados

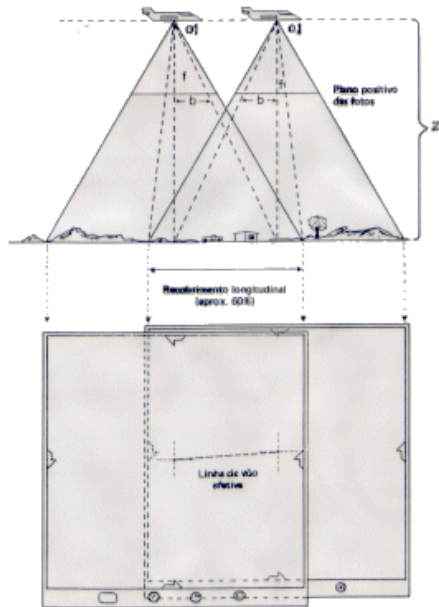
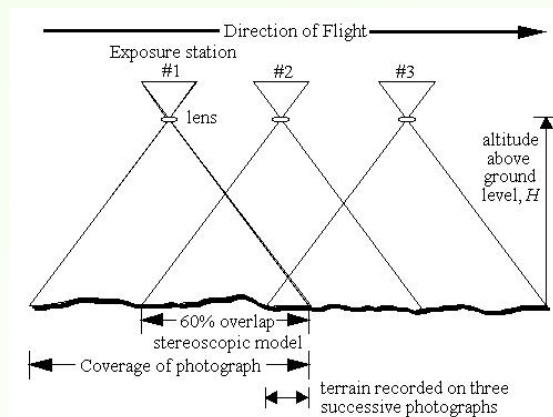
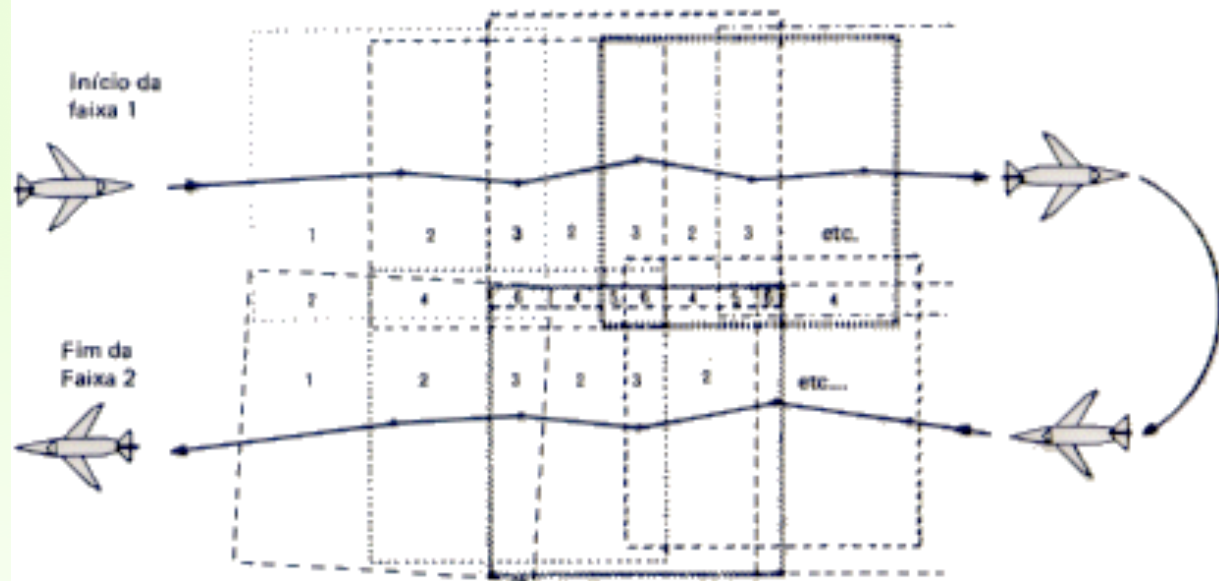
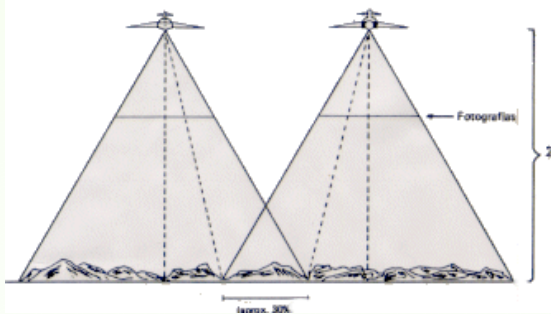


fig. 4.3 - Recobrimento longitudinal

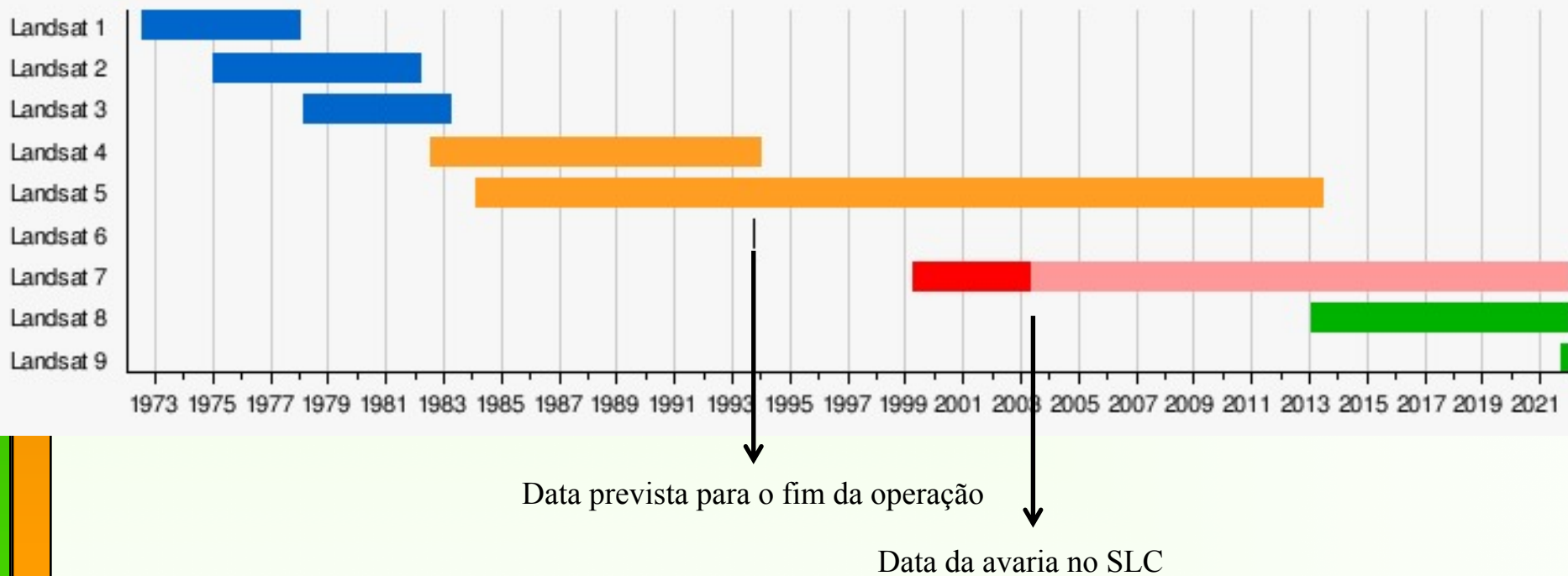


Programa Landsat

Instrument	Picture	Launched	Terminated	Duration	Notes
Landsat 1		July 23, 1972	January 6, 1978	2 years, 11 months and 15 days	Originally named Earth Resources Technology Satellite 1.
Landsat 2		January 22, 1975	February 25, 1982	2 years, 10 months and 17 days	Nearly identical copy of Landsat 1
Landsat 3		March 5, 1978	March 31, 1983	5 years and 26 days	Nearly identical copy of Landsat 1 and Landsat 2
Landsat 4		July 16, 1982	December 14, 1993	11 years, 4 months and 28 days	First of the TM sensors with 30 m spatial resolution.
Landsat 5		March 1, 1984	June 5, 2013 ^[7]	29 years, 3 months and 4 days	Nearly identical copy of Landsat 4. Longest Earth-observing satellite mission in history.
Landsat 6		October 5, 1993	October 5, 1993	0 days	Failed to reach orbit.
Landsat 7		April 15, 1999	Still active	16 years, 11 months and 27 days	Operating with scan line corrector disabled since May 2003. ^[8]
Landsat 8		February 11, 2013	Still active	3 years and 2 months	Originally named Landsat Data Continuity Mission from launch until May 30, 2013.
Landsat 9		September 27, 2021		Landsat 9 is a rebuild of its predecessor Landsat 8	

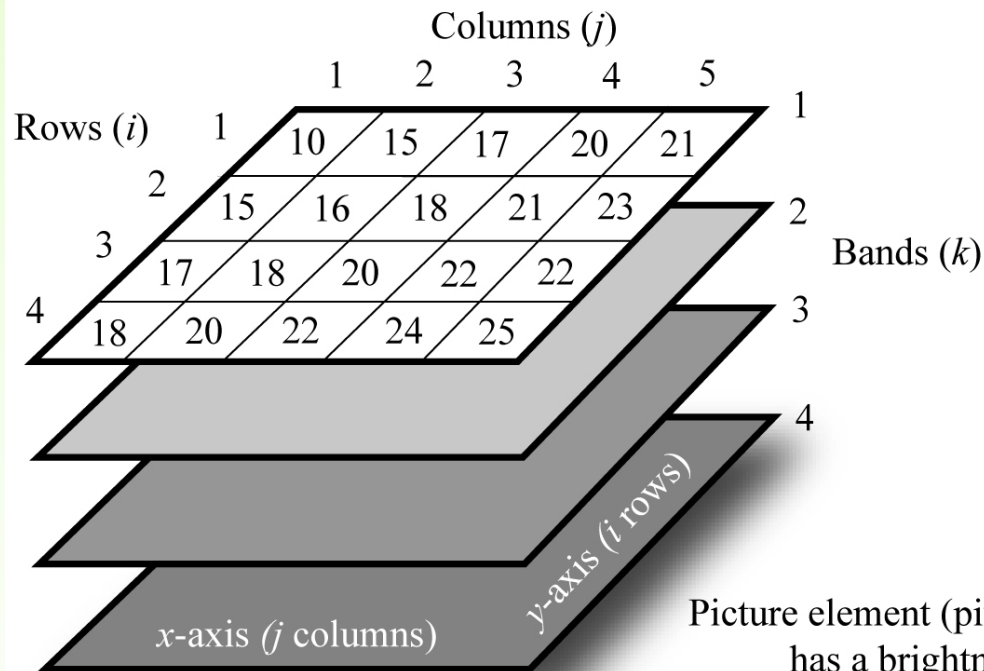
Programa Landsat

Chronological Launch and Retirement History



Estrutura de uma imagem digital

Digital Image Terminology



Brightness value
range (often 8-bit)

255 — white

127 — gray

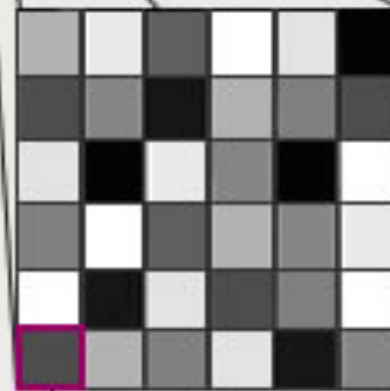
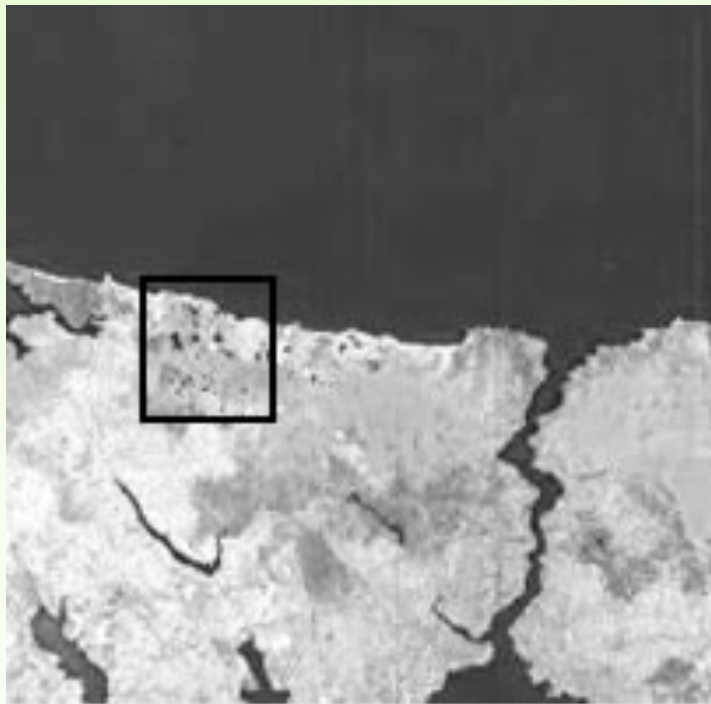
0 — black

Associated
grayscale



Picture element (pixel) at location row 4, column 4, band 1
has a brightness value of 24, i.e., $BV_{4,4,1} = 24$

Estrutura de uma imagem digital



Pixel

165	242	85	254	220	0
70	140	21	168	123	74
232	0	243	142	0	255
122	255	85	171	134	236
236	15	220	71	110	255
85	174	114	223	14	140

Digital Number
(DN)

Processamento digital de imagens: Funções

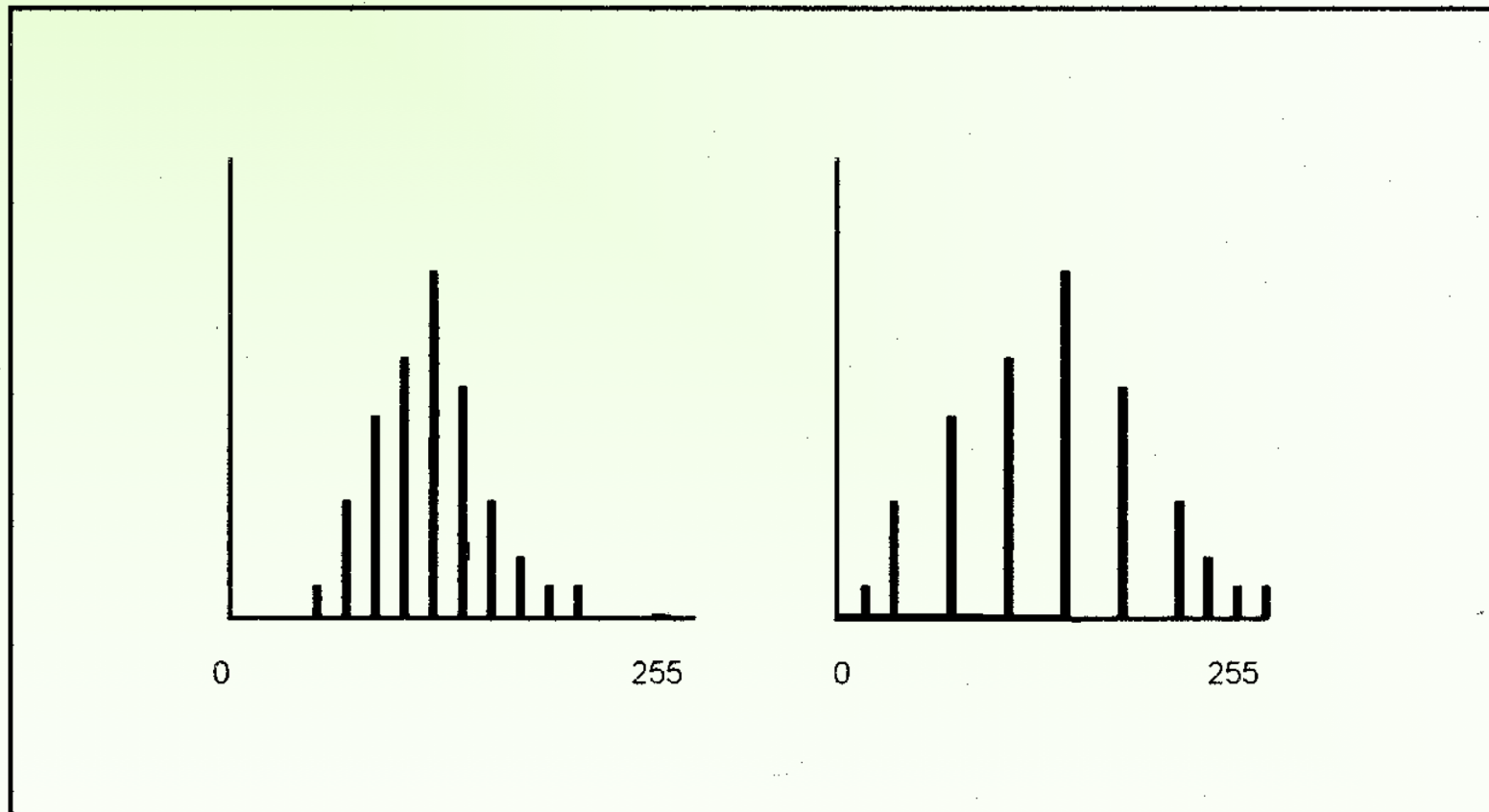
- Facilitar a identificação e extração da informação contida nas imagens para posterior interpretação;
- Remover ou amenizar degradações e distorções que limitam a capacidade visual humana;
- Processar grande quantidade de dados

Processamento digital de imagens

O processamento digital de imagens de sensoriamento Remoto é dividido em:

- Realce: aplicar contrastes nas imagens;
- Pré-processamento: correção radiométrica e geométrica das imagens;
- Classificação: realizar o mapeamento utilizando algoritmos de agrupamento de padrões.

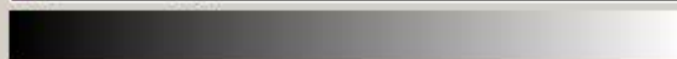
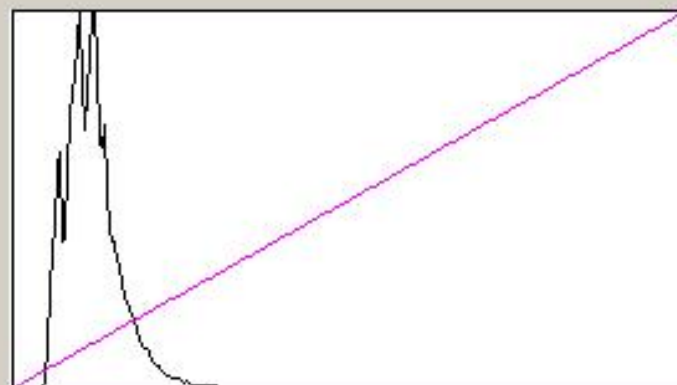
Aumento linear de contraste





Contraste

Operação Canal Exibir Executar Ajuda



Nível de Entrada: 125

LUT/População

Entrada: 125 0 Nova: 125 0

Média Edição(saída)

M: 30.60 G: B:

Valores Fatias

Mín: 0 CR Máx: 255 CR 5 CR

Salvar Imagem

Nome: Banda



Contraste

Operação Canal Exibir Executar Ajuda

Nível de Entrada:

LUT/População

Entrada: Nova:

Média

M: G: B:

Edição(saída)

Valores

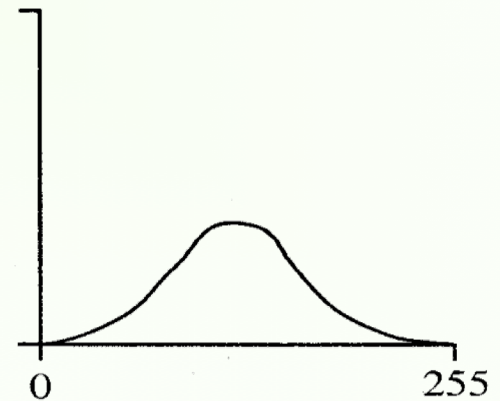
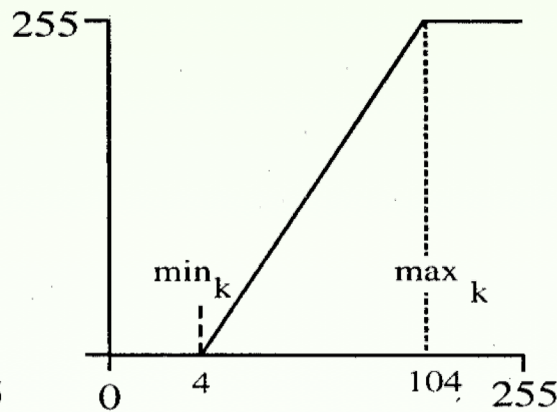
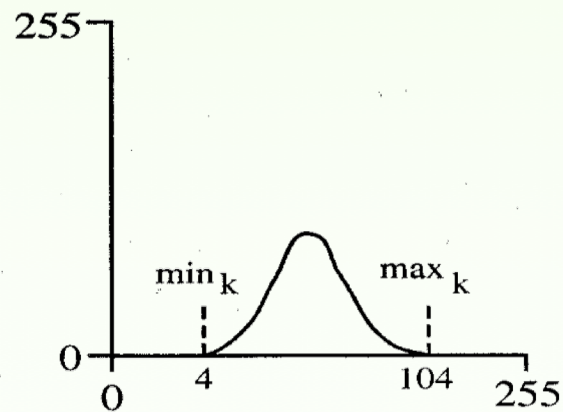
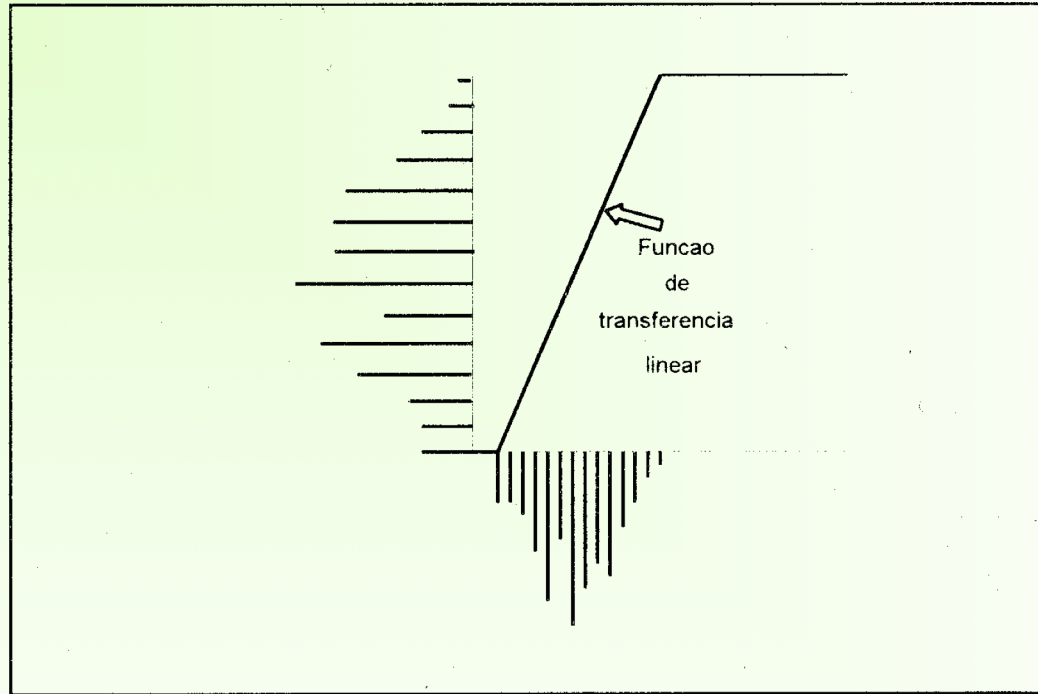
Mín: Máx:

Fatias

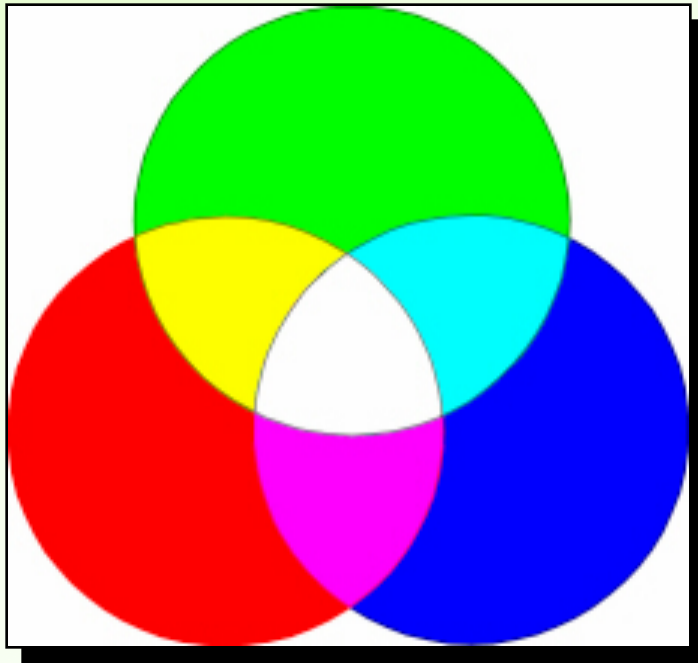
Salvar Imagem

Nome: Banda

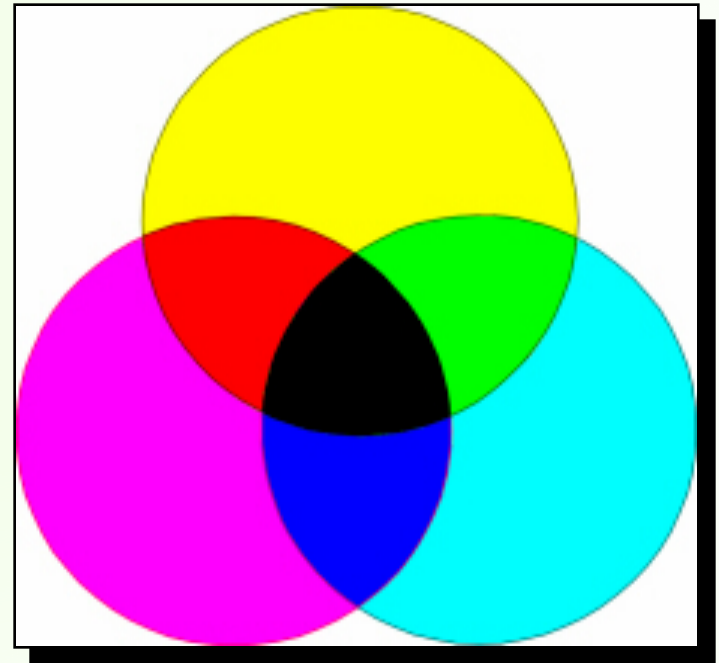
Função de transferência Linear



Composições coloridas RGB

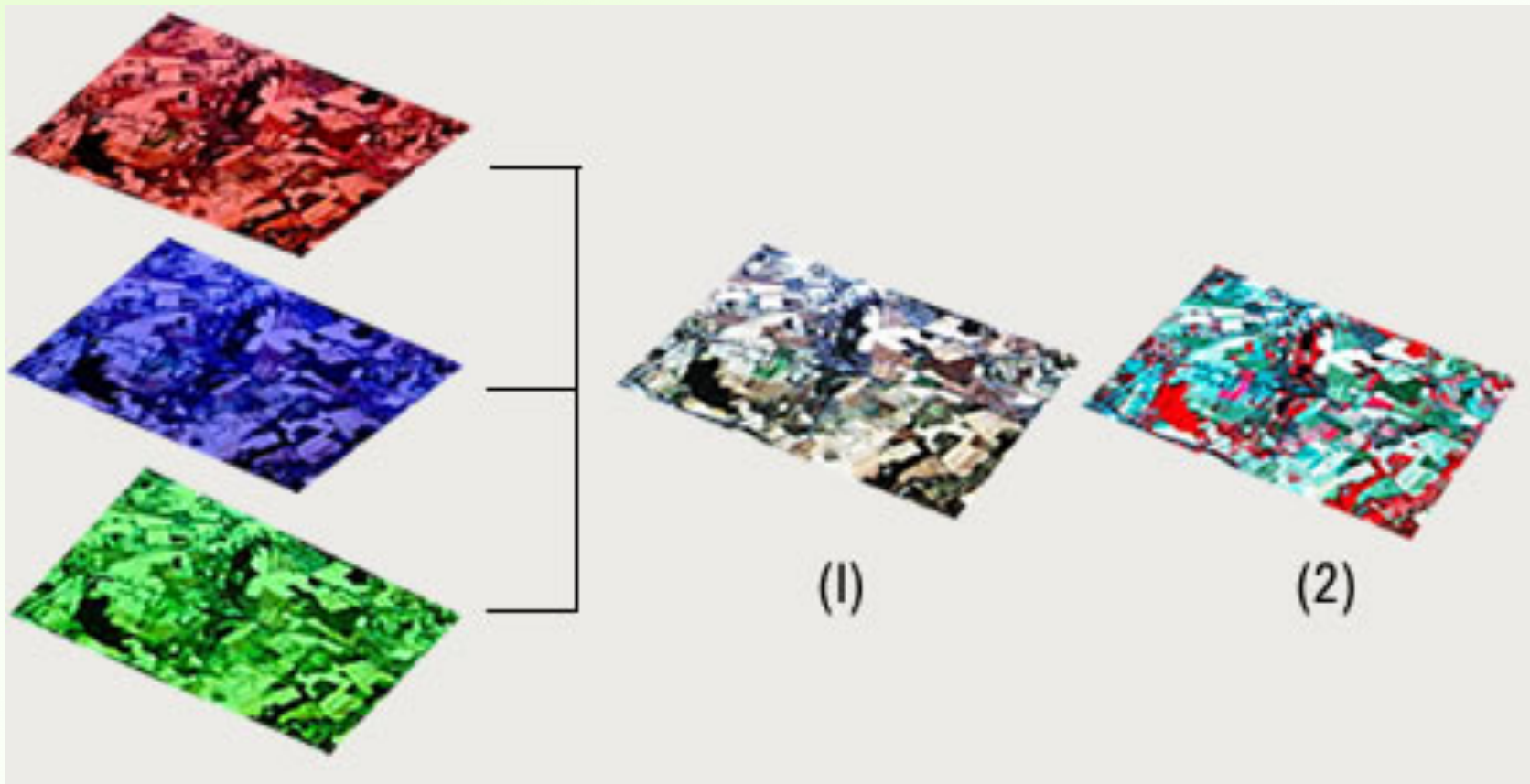


Aditivas



Subtrativas

Composições coloridas RGB



Composições coloridas RGB

Imagem Landsat 7 ETM+ da região de Santos - SP
Composição colorida 5 (R), 4 (G), 3 (B) - órbita 219/77 data 07/08/01



Banda 3



Banda 4



Banda 5

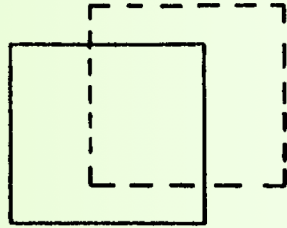
Composições coloridas RGB

imagem CBERS 2 CCD da região de Manaus - AM
composição colorida 4 (R), 3 (G), 2 (B) - órbita 173/103 data 17/08/04

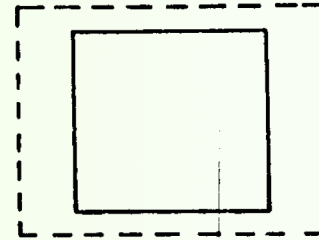


Distorções

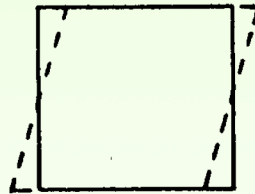
Translação



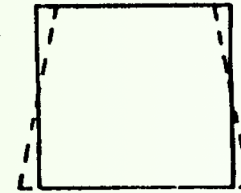
Altitude



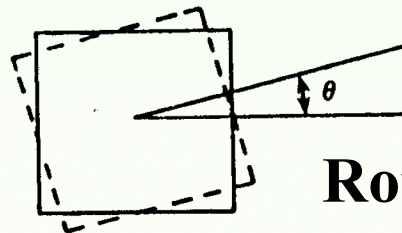
Inclinação



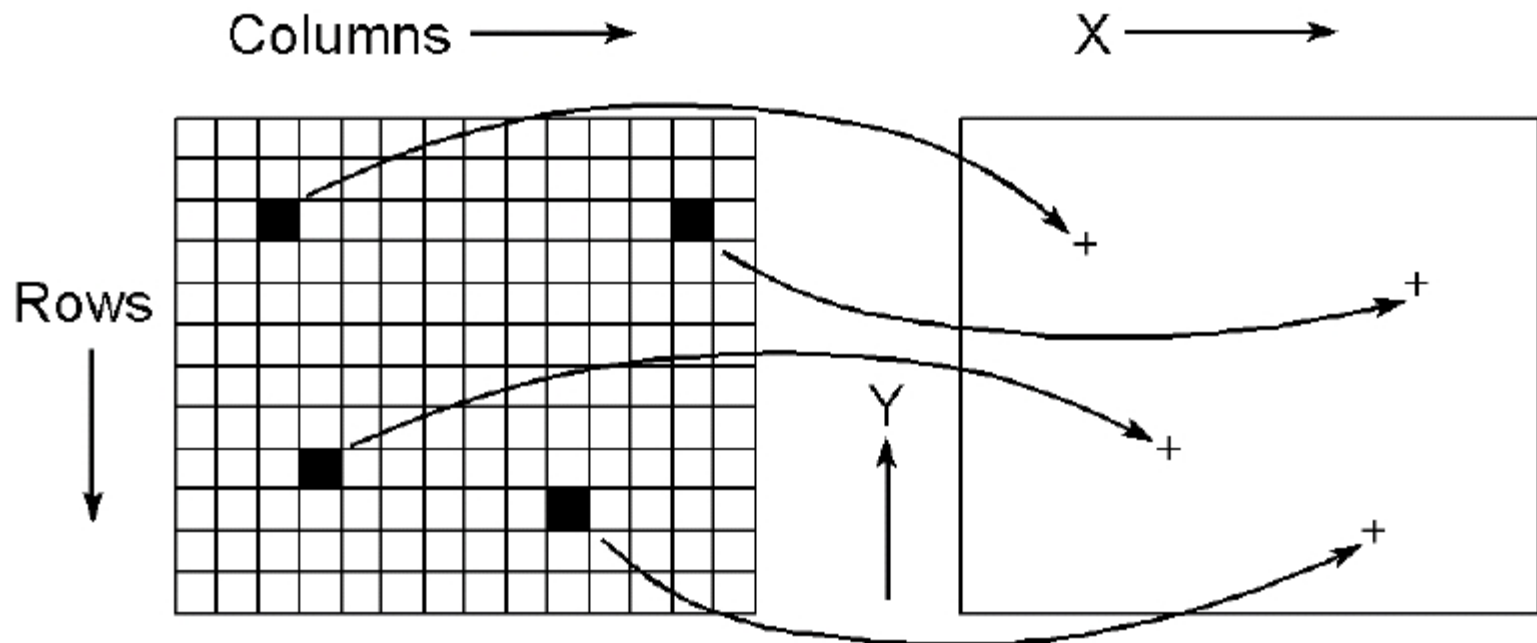
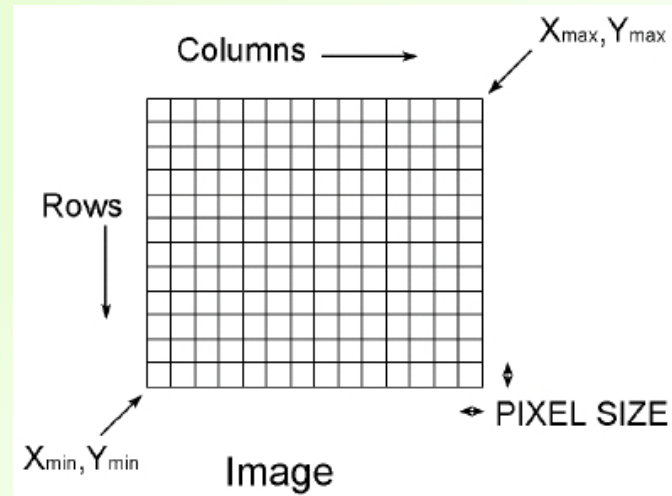
Perspectiva



Rotação



Georeferenciamento

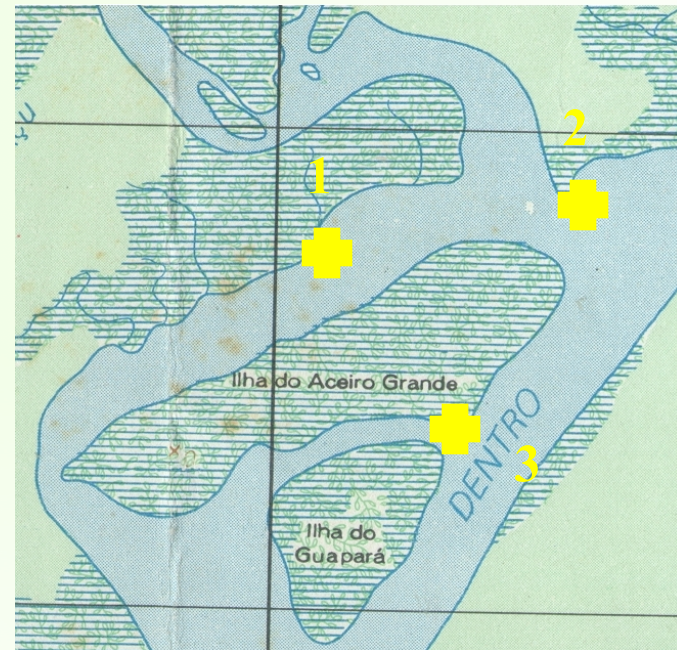


Georeferenciamento

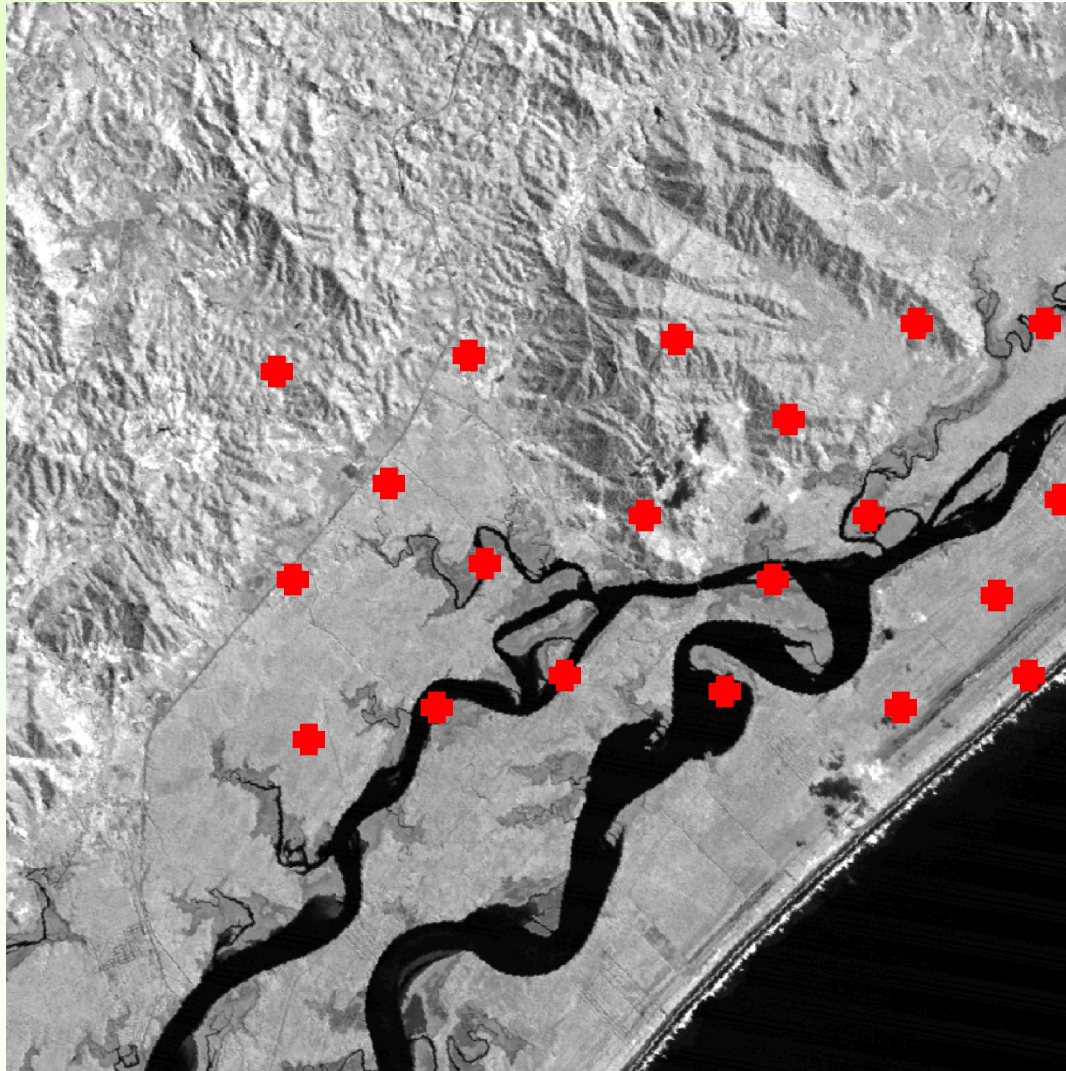


Georeferenciamento

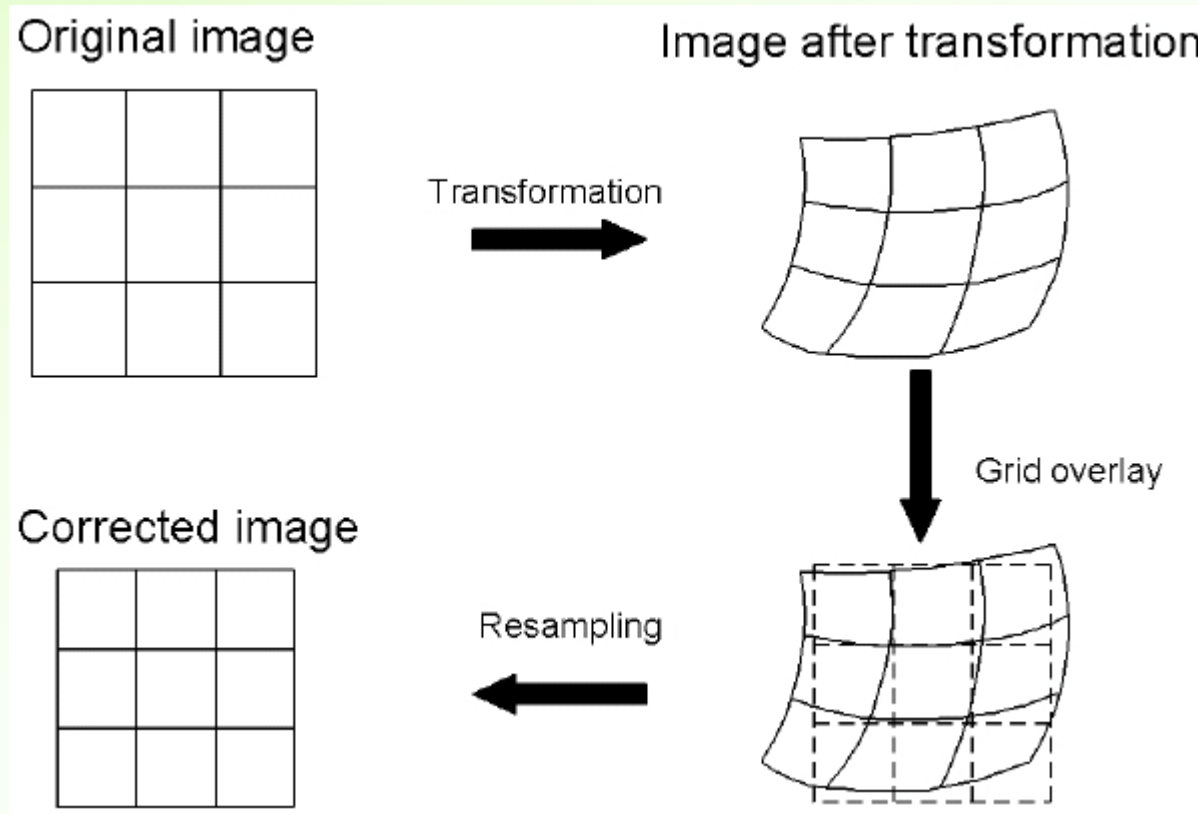
Seleção de pontos comuns



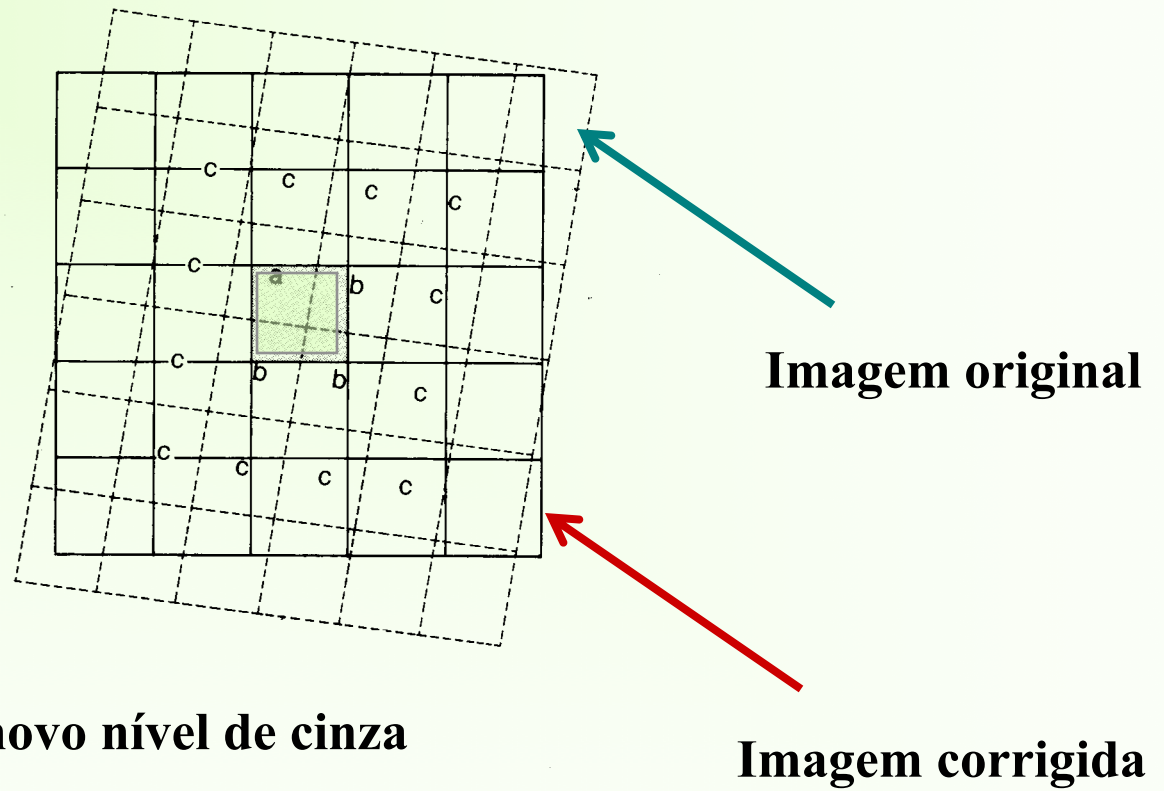
Georeferenciamento



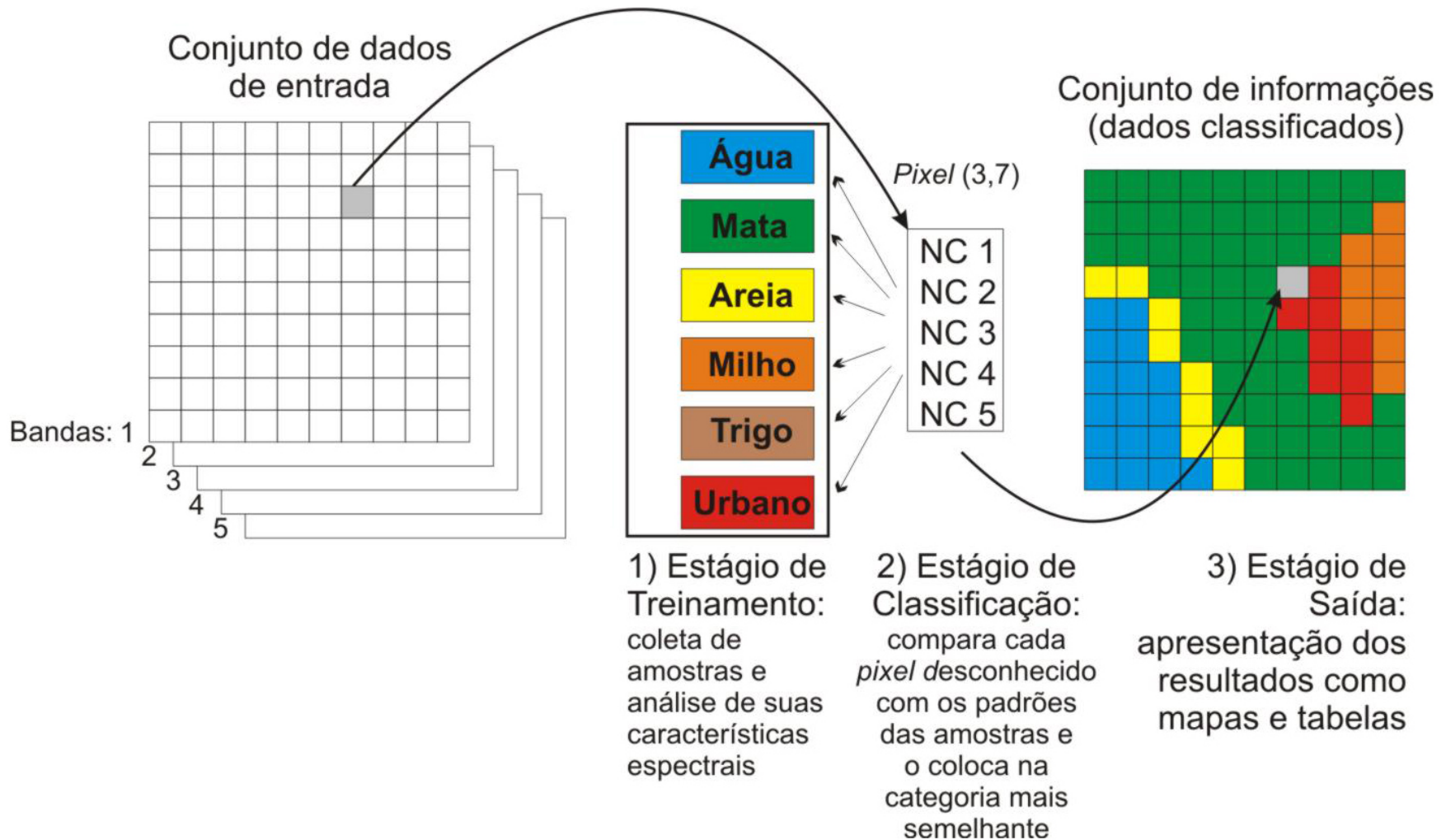
Reamostragem



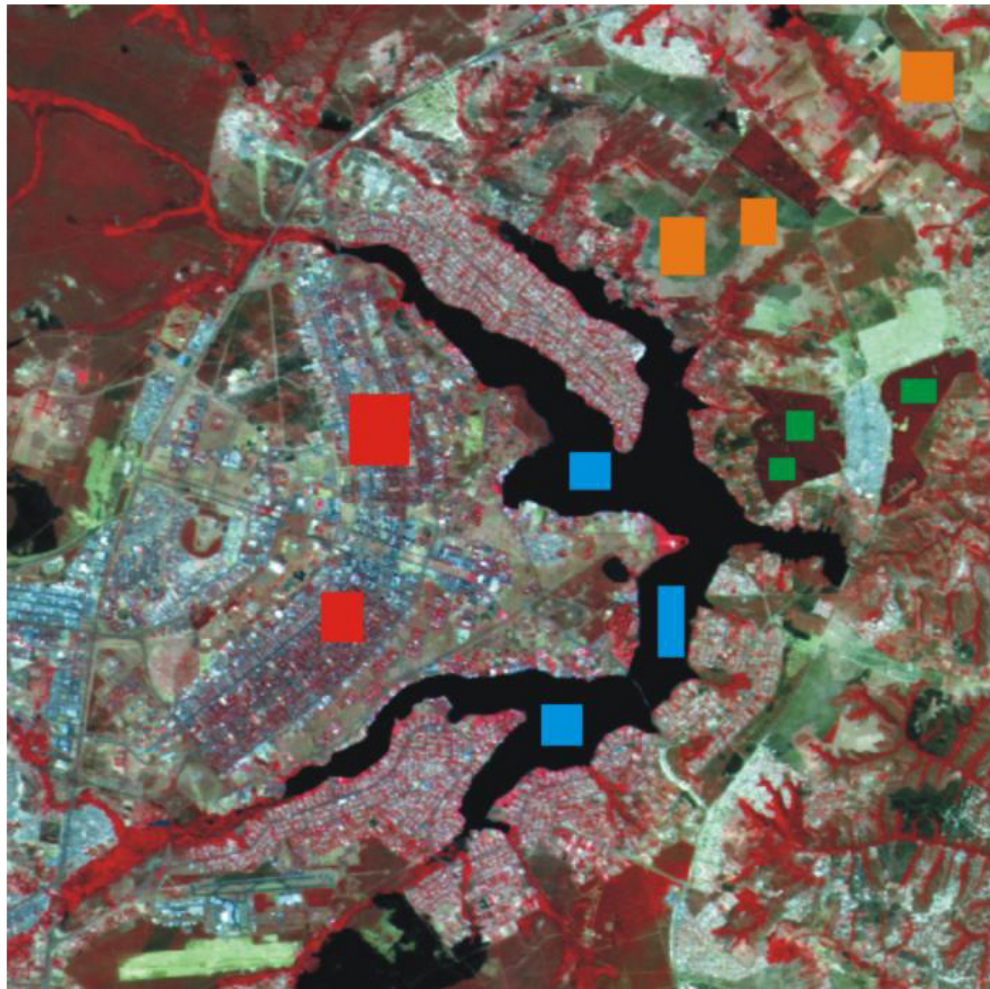
Reamostragem



Classificação de padrões



Seleção de amostras

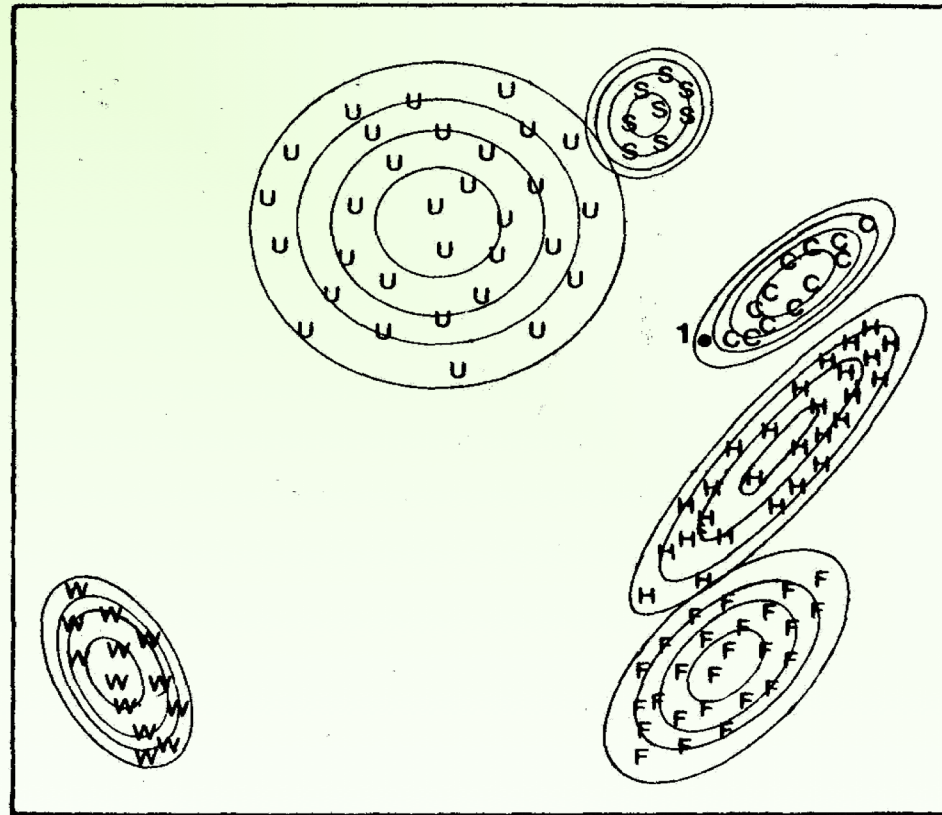


LEGENDA

-  Urbano
-  Água
-  Reflorestamento
-  Agrícola

Máxima Verossimilhança

Banda 2



Banda 1

Fichamento para entrega até o dia 16/11/2023

Os novos enfoques da Geografia com o apoio das Tecnologias da Informação Geográfica.

Reinaldo Paul Pérez Machado

<https://www.researchgate.net/publication/266387529>

O link para **baixar** o arquivo estará disponível no Moodle.
Fazer a entrega no próprio Moodle conforme instruções.

Exercício prático: Uso da Terra.

O objetivo é gerar um mapa imagem utilizando os recursos de processamento digital de imagens com as técnicas de classificação automática. Os alunos deverão executar 4 etapas segundo detalhado no tutorial:

- ✓ **Realce de Contraste**
- ✓ **Composições Coloridas**
- ✓ **Correção Geométrica**
- ✓ **Classificação**

PARA BAIXAR ILWIS

<http://ilwis-academic.software.informer.com/download/>



Muito obrigado pela atenção!